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ABSTRACT

This paper reviews seven studies comparing the differential effects of early childhood programs and approaches on children's development: (1) Planned Variation in Head Start; (2) Planned Variation in Follow Through; (3) Soar and Soar Study of Follow Through; (4) Miller and Dyer's Planned Variations Study; (5) Karnes Curriculum Comparison Study; (6) Ypsilanti Curriculum Comparison Project; and (7) A Comprehensive Assessment of the Imapct of Schooling. Studies compared academically oriented programs with cognitive discovery programs and/or discovery programs. Academically oriented programs included the Englemann-Becker Distar Program, the Bushell Applied Behavior Analysis model, the University of Pittsburg Individually Prescribed Instruction model, the Demonstration and Research Center for Early Education model, and the Karnes' Ameliorative model. Cognitive-discovery programs included Weikart's High Scope Model, the Tucson Early Education Model, the Nimnicht Responsive Model, the Gordon Parent Educator model, the Responsive Environment Corporation model, the Montessori and the Ypsilanti Piagetian-based, cognitively-oriented curriculums. Discovery programs were Bank Street, the Education Development Center model, and traditional nursery school classes. Also mentioned was the Community-Integrated Approach. Studies compared student achievement on standardized tests and on measures of social, moral, self-concept, problem solving and personality development. (SB)

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Differential Outcomes of Early Childhood Education

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Running head: Differential Outcomes

Abstract

Seven recent studies comparing the differential effects of early childhood programs on children's development have been critically reviewed. A few differential effects emerged, particularly in the areas of academic skills. It was suggested that future research attempt to establish relationships between process variables and child outcomes.

Differential Outcomes of Early Childhood Programs

In retrospect, the Summer of 1965 was a watershed in the field of early childhood education. Profound changes occurred. Greater emphasis was placed upon intellectual and cognitive development. Certain early childhood programs were found to be instrumental to child development in these areas, particularly with the children of the poor. An important question emerged: What types of early childhood programs were most effective? Proponents of the highly teacher-directed, academically-oriented programs argued their programs were most effective in enhancing intelligence and school achievement, because principles of learning theory were systematically applied to teaching young children. Proponents of discovery and informal learning approaches submitted that their programs were focused on the development of social skills, mastery, autonomy, and social problem solving. These were often de-emphasized by the academically-oriented programs. However, discovery learning proponents argued that these were areas of pre-eminent importance to the young child.

Since 1965, a new group of early educators has emerged who argued that all aspects of development were important: affective, cognitive, and psychomotor. The cognitive skills that such programs attempted to influence were thinking, organizational, and processing skills. These program developers looked mainly to Piagetian theory as a basis for curriculum design. Teacher behavior, child behavior, and instructional settings in these cognitive-discovery programs represented midpoints between the two extremes represented by the academic and the discovery programs. Several educators have discussed these three approaches in substantially greater detail (Cowles, 1971; Evans, 1975; Stevens and King, 1976).

In the decade since 1965, seven major studies have been conducted in an attempt to answer a fundamental question: What are the differential effects of critical aspects of early childhood programs? As such programs continue to expand in number this question becomes of increasing importance to the school psychologist. In the research and consultation role, the psychologist is called upon to assist in selecting, designing, and evaluating programs for young children. School psychologists need to be able to interpret relevant research data in early education and child development and help to formulate the important questions to be answered through carefully designed educational research and evaluation. Research which has examined the differential impact of early schooling can assist the psychologist in this role. As one examines the selected research reviewed here, clear direction emerges as to how future research should be formulated and conducted.

Planned Variations in Head Start

Beginning in the Fall of 1969 and continuing for three successive years, children in selected Head Start Centers across the country participated in several different curriculum approaches. This planned variation was an attempt to answer three questions: 1) Do different types of early childhood programs influence children differentially; 2) What strategies are required to successfully install a program model at some distance from its development site and staff; 3) Do such programs operate consistently with theoretical expectations? A variety of models were selected for inclusion in the study. Generally, these were ones most thoroughly developed and yet representative of divergent views. Academically-oriented ones included the Englemann-Becker Distar Program, the Bushell Applied Behavior Analysis (ABA) model, and the University of Pittsburg Individually Prescribed Instruction (IPI) model. Programs considered to be in

the cognitive-discovery group were Weikart's High Scope model, the Tucson Early Education Model (TEEM), the Nimnicht Responsive model, the Gordon Parent Educator model, and the Responsive Environment Corporation (REC) model. Programs labelled as discovery were Bank Street and the Education Development Center (EDC) model.

Results have been discussed in three separate reports representing the three waves of children participating in the study (Bissel, 1973; Smith, 1973; Weisberg, 1974). Essentially no significant differences were found in the first year. However, in the second and third years there were some differential effects. Smith (1973) reported that the academically-oriented programs significantly enhanced young children's knowledge of shapes and naming of numerals and letters. No differences between programs emerged on other specific tests of pre-science and pre-math concepts or on global measures of preschool achievement. Children in Weikart's High Scope model (a cognitive-discovery program) were found to be performing at a higher level on the Stanford-Binet.

Data for the third year (Weisberg, 1973) did not corroborate the superiority of the High Scope model. No program differences were found. However, children in the academically-oriented programs did significantly better on certain specific achievement subtests: matching and recognizing letters, reading numerals, counting, and matching equivalent sets. Again, a global preschool achievement test revealed no program differences.

There are significant threats to internal and external validity in the Head Start Planned Variation study. Children or classrooms were not randomly assigned to treatments. Within some limits, communities could select the model to be used. However, each of the models did include rural and urban sites with some regional distribution. Undoubtedly, systematic differences in the ethnic/

cultural composition of the children assigned to models existed. Likewise, there may have been differences in the degree of implementation of the various models. In the initial year, Bissel (1973) indicated that more highly specified, academically-oriented programs may have been more effectively installed than the other approaches. Discovery programs which attempt to train teachers in the same manner as they teach children probably require a longer time period for teachers to attain competency.

Planned Variations in Follow Through

Project Follow Through was begun in the Fall of 1968. Evaluation data from early preschool intervention projects suggested that special primary grade programs may be needed if gains low income children made were to be maintained. Programs selected for inclusion in the national study were not only representative of a wide range of child development theories but also based on fundamental redefinitions of the school as a social institution. Some twenty-two models were included in the initial round of programs. Stallings (1975) examined the effect of seven of these programs. Academically-oriented programs included were the Englemann-Becker Distar program and the ABA program. The Nimnicht Responsive model, TEEM,and Weikart High Scope model were the cognitive-discovery programs. EDC and Bank Street were the discovery programs which were included.

Systematic classroom observation was conducted to identify critical differences in teacher and child behavior, instructional settings, and organization of equipment and materials. Such differences were greater at first than at third grade. At first grade, the principal group of variables which distinguished models was the degree of structure. In some models, children worked fairly independently and on a personalized basis with adults. These classrooms differed from others in which teachers worked with children in small and large

groups. Distar and ABA classrooms looked more like the latter group and the Nimnicht Responsive model and EDC classrooms like the former. At third grade, a similar group of variables differentiated various classrooms. Classrooms in which there were arts and crafts materials and in which children worked independently (Nimnicht, Bank Street, and EDC) were distinguished from classrooms in which teachers worked with small or large groups in academic subjects, particularly mathematics. Second and third order sets of variables were found to distinguish the model classrooms but are less succinctly interpreted.

Differences in child behavior were also observed. Behaviors such as independence, task persistence, cooperation, and questioning were examined and discussed as outcome measures. However, as certain classroom models allow children more opportunity to manifest such behaviors, it seems more appropriate to deal with these as process variables. Observed differences were in line with theoretical expectations. Children were more independent (i.e. engaged in tasks without an adult) in classrooms in which a variety of materials and activities were provided, in which the children selected their own groups and activities, and in which adults provided individual attention and made friendly, supportive comments. This was most characteristic of EDC and Nimnicht Responsive model classrooms. In those classrooms in which textbooks and workbooks were used and in which adults interacted with individuals rather than with groups, children were more persistent. TEEM and Bushell ABA classrooms were highest on this dimension. Children in Bank Street, High Scope, and EDC were observed to manifest more cooperative behavior. In classrooms in which many different activities and manipulatives were provided, adults interacted with one or two children in questioning and commenting about their work, and children chose their own groupings, cooperation was observed more frequently. Children appeared to ask more questions

in classrooms where adults responded to those questions, made general conversation with children and individual exchanges with a child were frequent. In Nimnicht, Bank Street, Bushell, Weikart, and EDC programs children questioned more than children in other models. This suggests such programs may be more supportive of an inquiry approach. Resnick (1972) found that teacher-child interactions in open classrooms were characterized by numerous short-term transactions, some of which were nested within larger continuing units. Many of these contacts were child-initiated.

Differential outcomes were also found in children's functioning in a variety of tasks. In general, it appeared that those programs which spent more time on reading and math instruction had children who performed better on achievement tests in these areas. Whether this academic work was teacher-directed or child-directed appeared to be less important than the amount of time spent in such activities. However, children in academically-oriented programs performed better than children in informal classroom programs (e.g. EDC, Bank Street). This may appear somewhat contradictory; but one must remember that while children in open classrooms devote time to academics, they also work on science, music, art, and possibly movement exploration and creative dramatics. Higher reading scores were found in classrooms in which teachers gave information and asked direct questions and in which children responded and the teacher provided feedback about the accuracy of the response. Reading scores were higher in classrooms where workbooks and programmed texts were used.

Math computation subtest scores were most highly correlated with variables of the structured models and negatively with those of the flexible, open models. However, there were fewer negative correlations between scores on the problem-solving subtest and informal classroom variables such as the presence of

manipulative materials and personalized instruction. This may indicate that variables in informal classrooms may be detrimental to performance on a computation subtest but not to performance on the problem-solving subtest.

The Raven's Colored Progressive Matrices was administered to third graders to assess perceptual problem-solving ability. Children in informal classrooms performed significantly better on this measure. Variables such as degree of child independence, child questioning, presence of variety of manipulative materials, high levels of adult-child conversation about tasks, and expressions of both positive and negative affect were all positively related to effective problem-solving skills. These types of instructional exchanges appeared to promote the development of problem-solving ability more than the direct question-child response-adult feedback exchanges that were positively related to reading achievement and math achievement.

In classrooms where adults asked direct academic questions (which probably require the recall of previously learned information), children performed less well on problem solving. High frequency of reading and math and the use of tests and workbooks were all negatively related to problem-solving ability. White (1968) has suggested that in learning there is probably no positive transfer without some negative transfer. It may be that an instructional process which promotes the acquisition of certain types of skills may inhibit the acquisition of others. This is an argument for designing future comparative research in ways that allow one to examine such relationships.

Effects on affective development were also examined. No significant differences in self-concept as measured by the Coopersmith were found among children in various programs. Children in classrooms which allowed for more independence were more likely to accept responsibility for their success.

However, children who selected their own groups were independent, often worked individually with teachers, and had manipulative materials were less likely to accept responsibility for failure. In teacher-directed classrooms, the reverse was true.

Stallings also found that children in different models manifested different rates of absence. Children in the more flexible program (cognitive-discovery and discovery) were absent less. Absence rates were lower in classrooms in which adults responded to children's questions, children asked more questions, children worked independently of adults, there was more smiling and laughing, adults tended not to work in large groups, and the adult feedback for child behavior (both positive and negative) was low. This is an especially critical finding when the relationship between time spent in instructional activities and learning is carefully considered. Absent children's time is likely not spent in activities focused on program objectives; therefore, learning in those targeted areas is more unlikely.

Stallings' study represents an advance in comparative research. She carefully observed in classrooms and assessed the environment, child, and teacher behavior and then related these process variables to child outcomes. There are, however, limitations inherent in the study. Stallings has commented that perhaps the observation instruments were more sensitive to differences between the academically-oriented models than to those between the more flexible, open approaches. Baseline measures of the outcome variables were not collected, though children in the study were tested at the beginning of the year on the Wide Range Achievement Test. Scores of criterion measures were adjusted on the basis of these entering WRAT scores. Another limitation of the study was the inability to randomly assign children to either treatment or comparison group.

Constraints similar to those in the Head Start Planned Variations study were operative. On the positive side, Stallings incorporated a variety of outcome measures: affective and cognitive, behavioral and psychometric.

The Soar and Soar Study of Follow Through

In an earlier study of Follow Through, Soar and Soar (1972) found sinificant relationships between classroom processes and particular types of pupil growth. They observed in seven types of kindergarten and first grade Follow Through classrooms representatives of the full range of programs from academically-oriented (BE) to discovery (EDC). Children in each of these classrooms were assessed on tasks which measured simple-concrete and complex-abstract subject matter.

Process variables in each of these classrooms differed as documented by observation data. These process differences were distinguished by two major factors. The first was a free-choice versus structured-learning-in-groups factor. In classrooms in which the former type of instructional setting predominated, children worked collaboratively, independently of direct adult involvement, using manipulatives, with adults and children moving freely about the room. The second factor was labeled teacher-directed activity versus pupil-selected activity. In classrooms using mostly teacher-directed activities, teachers asked specific, highly focused questions to elicit specific responses from pupils and provided feedback to children about the correctness or incorrectness of their responses.

Subtests of the Metropolitan Readiness Test, the Deutsch Early Childhood Inventory, and the Preschool Inventory were utilized to assess pupil growth. Subtests loading on the complex-abstract factor were word meaning, copying, shape names, associative vocabulary, and concept-activation-sensory. Alphabet and numeral naming were the principal subtests loading on the concrete-simple factor.

The only classroom variable positively related to concrete-simple pupil growth was participation in highly focused learning tasks. Abstract-complex pupil growth appeared to be supported by a larger number of variables: information giving and receiving, broad answers, moderately focused learning tasks, high levels of teacher talk, pupil initiation, and teacher support in task settings (or firm control in highly differentiated activity settings). High levels of teacher talk was most supportive of abstract-complex growth but involvement in activities requiring complex thinking skills was not related to this type of cognitive growth at this age.

Soar and Soar concluded that there were optimal levels of pupil-selected activity versus teacher-directed activity and of pupil initiation versus drill which foster complex-abstract growth. Classrooms which include a balance of these activity settings are most supportive of complex-abstract growth. However, there were positive linear relationships between teacher-directed activity and concrete-simple learning and between drill and concrete-simple learning. Such cognitive growth was fostered by these latter types of instructional activities.

Miller and Dyer's Planned Variations Study

In the Summer of 1968 Miller and Dyer (1975) initiated a study comparing the effectiveness of four different preschool programs. The Demonstration and Research Center for Early Education (DARCEE) model and the Bereiter-Englemann Distar model were academically-oriented approaches included. Montessori represented the cognitive-discovery approach and the Traditional nursery school program represented the discovery approach.

Various Head Start classrooms in Louisville, Kentucky, were randomly assigned to one of the experimental groups or to the control group. Complete random assignment of classrooms to each treatment was not possible since only

two qualified Montessori teachers could be recruited. There was, however, one Distar, Traditional, and DARCEE classroom in each of the four schools. Demographic data indicated that groups were not significantly different in age and education of the parents, number of siblings, and other relevant variables. This design is appropriate and is feasible in many public school settings.

Children participated in the programs during the prekindergarten year. They then entered either a regular Kindergarten program or a Follow Through kindergarten in which the Bushell Applied Behavior Analysis model was used. Miller and Dyer followed the children until the end of second grade. The present discussion focuses on the data from the initial year since the primary interest of this paper is in the short-term effects of participation in different types of early childhood programs.

Information about the degree to which the programs conformed to the intended model was systematically collected. Consultants, expert in each curriculum approach, trained the teachers and assessed the degree to which their model was implemented as intended. Data indicated that all classrooms conformed to expectations for that model.

Direct observation was also used to describe teacher and child behavior, classroom environment, and instructional setting. Data revealed that two types of classroom structures were operating. In one type of structure teachers engaged in fast-paced instruction, learning activities were teacher-centered, and a few stable groups of children generally worked on the same task. The second structure was child-centered and slower-paced. When children's activities were considered, there were four distinct treatments distributed along a single continuum. At one end of the continuum were those classrooms in which a high level of verbal recitation and a low level of role playing were found. By

ordering the model programs along this continuum from those of which this was most characteristic to those for which it was least characteristic, the following ranking was derived: Bereiter/Englemann, Montessori, DARCEE, and Traditional. Montessori was unlike the other three in that both conversation and manipulation of materials were present. Bereiter/Englemann was differentiated from the other programs by the high ratio of group versus individual performance; only in this program was there more teacher contact with groups than with individuals.

Effects of the programs on the children were compared using measures of both cognitive and motivational variables. In general, the findings do not reveal expected differences. Miller and Dyer reported that children in the academically-oriented programs (BE and DARCEE) performed significantly better on the Stanford-Binet than children in the Traditional and Montessori programs. However, the mean differences, though perhaps statistically significant, were small. No differences between classrooms were found on a global preschool achievement measure, the Preschool Inventory. Performance among the groups on the Arithmetic Test and The Basic Concept Inventory was not significantly different. A similar finding was obtained from analysis of performance of groups on the Parellel Sentence Production Test. However, on the latter three tests, group means were consistently ordered from highest to lowest as follows: BE, DARCEE, Montessori, Traditional.

A variety of measures was used to assess motivational variables. A curiosity box task assessed children's exploratory behavior and accompanying verbalization. In a replacement puzzle task, a measure of persistence was obtained. The Dog and Bone test provided a measure of innovative behavior or inventiveness. Teacher ratings of classroom behavior (verbal-social participation, aggression, timidity, independence, and achievement motivation) were also collected.

The behavior rating scale on the Stanford-Binet provided a measure of child response during test performance on problem solving, independence, and attentional behavior.

Children in the DARCEE and the Montessori programs were found to be superior in inventiveness. Further analysis of the classroom observational data suggested that these two programs were alike in providing children with low amounts of negative feedback. In BE and Traditional programs, in which children were low on inventiveness, high amounts of negative and corrective feedback were given. Within-group analysis indicated that the BE teachers who gave the lowest amount of negative, corrective feedback had children who scored higher on inventiveness. Such relationships are illustrative of the importance of measuring actual treatment (process) variables and relating these to child outcomes. DARCEE children were also rated higher on scales of ambition and verbal-social participation. The Traditional children were high in curiosity and verbal-social participation. Montessori children were high on inventiveness and curiosity.

The Miller and Dyer study has several strengths. Classrooms were randomly assigned to treatments within schools. Some control of the quality of treatment implementation was possible through initial staff training and limited follow-up monitoring. A sizeable number of subjects (250) participated. The design included a replication across schools and each treatment group included more than one teacher; this encourages confidence that observed outcomes were due to the treatments rather than principally to school or teacher variables.

Process variables were systematically measures. In some cases these were related to child outcomes. A variety of child functions were examined; but results of the study do not strongly support the assertion that differential outcomes are produced by participation in different programs.

Karnes' Curriculum Comparison Study

In 1965, Merle Karnes initiated a study comparing the effectiveness of five preschool programs (Karnes, 1973). The Bereiter/Englemann (BE) and the Karnes' Ameliorative programs constituted the academically-oriented programs. The BE program emphasized teacher-directed instruction in reading, language, and arithmetic. The Ameliorative program utilized teacher-directed activities focused on language, mathematics, science, and social studies objectives and was conducted in a game-like format. The Traditional and Community-Integrated approaches represented mainstream nursery education; social and emotional development of the young child were central to these programs. In the Community-Integrated program, low income subjects in the study were mixed with middle income children. A Montessori classroom was included and can be designated a cognitive-discovery program.

The effects of the programs on the intellectual development, langauge development, academic readiness, and perceptual-motor functioning were assessed. Children in the Ameliorative and the BE programs performed significantly better on the Stanford-Binet than did children in the Community-Integrated or Montessori groups. However, mean scores of the two former groups were not significantly higher than the mean of the Traditional group. The developers of the program maintained control of the treatments in the Ameliorative, Bereiter/Englemann, and Traditional treatments but not in the other two.

Children in the Ameliorative group performed significantly better than the Community-Integrated group and the Montessori group, but not differently from the BE and Traditional groups on the vocal encoding, auditory-vocal automatic, and auditory-vocal-association subtests of the Illinois Test of Psycholinguistic Abilities (ITPA). No significant differences were found between the

BE and the Traditional children. Montessori children performed significantly poorer in language than did any of the other groups. Evans (1975) has pointed out that Montessori programs often appear to de-emphasize the development of oral language abilities.

In perceptual-motor development, children in the Ameliorative group performed significantly better on the Frostig Test of Visual Perception than children in the other four groups. The Ameliorative program emphasized the systematic development of perceptual motor skills. However, it is somewhat surprising that the Montessori children did not perform at a higher level given the systematic emphasis in the program on sensory motor skill development, via autotelic, self-correcting learning materials.

In the second year of the program, all children but the BE group entered regular kindergarten. The Ameliorative group attended a one-hour supplementary session which emphasized reading and mathematics readiness. Only the BE group continued to manifest gaines in IQ; their mean scores were significantly higher than those of the other four groups, including the Amerliorative. Similarly, only the BE group continued to manifest gaines in language development. Scores of the Ameliorative, Traditional, and Montessori groups tended to converge. Language training was not an instructional focus during the second year of the Ameliorative program, but this group was superior to the other four groups on reading readiness skills. This was true even though the BE program also emphasized the development of reading skills. Both the BE and the Ameliorative groups performed significantly better on the number of readiness subtest of the Metropolitan.

The Karnes study demonstrated the phenomenon of "specificity of effects" that Bissel (1973) has discussed; programs influence those areas of development

which match the program objectives. While Karnes employed a fairly wide range of measures (cognitive, language, readiness, and perceptual-motor development), affective development was not systematically assessed. Greater quality control was probably maintained in the Ameliorative, BE, and Traditional programs. Outside agencies administered the Montessori and Community-Integrated treatments. The poor performance of children in these programs on some measures may have been due to the possible differences in the quality of implementation.

No data were collected to describe child behavior, teacher behavior, or instructional settings in the classrooms. It would have been most fortunate if, in this very early study, such process data were available to relate specific treatment variables to specific child outcomes. Modest numbers of children were included in the Ameliorative, BE, and Traditional groups - 30 subjects in each. One class of 15 children comprised each of the Montessori and Community-Integrated groups. In this study it is difficult to sort out variation due to teacher differences.

Ypsilanti Curriculum Comparison Project

Weikart (1969) compared the impact of three different curriculum approaches on young children's development: a teacher-directed, language-based curriculum; a Piagetian-based program; and a traditional, unit-based approach. The language-based approach was the Bereiter/Englemann program, an academically-oriented one. The Piagetian-based, Cognitively-Oriented Curriculum was a cognitive-discovery program. The unit-based approach can be classified as a discovery program. Children were randomly assigned to each of the three treatment groups. In each of two subsequent years a replication of the original experiment was conducted. Groups were compared on language and intellectual development.

There were no significant differences among the groups, but all made impressive (and statistically significant) gains on the Stanford-Binet.

Similarly, differences between group posttest scores on the Leiter International Performance Scale and the Peabody Picture Vocabulary Test were non-significant. Weikart concluded that different curriculum approaches, if all of a high quality, have little differential impact. Variables that were critical for the quality of the program included teacher commitment and high expectations for pupil achievement, careful supervision of teaching staff, systematic curriculum planning and evaluation, and team teaching.

All treatments were monitored by the principal investigator and his staff. Each received similar support and technical assistance. Small numbers of children were involved in each replication, but similar findings in each of the replications increase confidence in the results. As no measures of affective or motivational variables were included, some treatment effects may not have been assessed.

A Comprehensive Assessment of the Impact of Schooling

The effects of two different educational approaches was conducted by Minuchin, Biber, Shapiro, and Zimiles (1969). These investigators compared the schooling experiences and their effects on advantaged fourth graders. Children in modern (discovery) classrooms were compared with children in traditional (academically-oriented) classrooms on several variables: intelligence, achievement, problem solving, moral development, imaginative thinking and self-concept.

On achievement tests and a group intelligence test, children in the academically-oriented classrooms scored significantly higher. However, no significant differences were found on individual IQ tests. No differences between groups were found on self-concept and individual problem-solving measures. On a group problem-solving task, children in the discovery classrooms exhibited greater cooperation, used more well organized strategies, and solved

the problem more frequently. Children in the discovery classrooms were more likely to attribute negative as well as positive traits to themselves than were children in academically-oriented classrooms; however, there were no differences in self-acceptance. Although no differences in amounts of imaginative thinking were found, some thematic differences did emerge. Discovery children's responses appeared to be more child-oriented while those in academic classrooms were more adult-oriented.

A major limitation of the Minuchin et al. study is that criterion measures were obtained only once. Differences in children's behavior may have been present prior to exposure to a particular schooling experience. The investigators reported some continuity between the values and attitudes prevalent in the home and those espoused by the school.

A strength of this particular investigation was the attempt to examine the impact of schooling on a very broad set of variables: affective and cognitive. No attempt was made, however, to relate actual classroom process variables to child outcome measures. Classrooms were observed and teachers were interviewed. Specific values of these observed differences were not related to child outcome as in the Stallings (1975) and Soar and Soar (1972) investigations.

Conclusion

Few clear-cut, firm answers to questions about the outcomes of early childhood programs emanate from this review. In addition to the complexity of the variables themselves, failure to use common instruments, to assess similar variables, or to operationalize similar variables in a standard fashion have worked to obscure relationships. Nevertheless, there is structure and coherence among the data. Certain critical aspects of early childhood programs do appear to differentially relate to young children's development. Studies which appear

to demonstrate such findings share several characteristics:

(a) A wide variety of child behaviors, functions, and abilities have been assessed: cognitive, social, self-concept, motivational, and problem solving.

(b) Assessment instruments, or tasks, have been highly focused and specific rather than global (yielding composite scores for diverse subtests or sub-parts).

(c) A variety of strategies have been used to assess a particular function: child-structured tasks and adult-structured tasks, behavioral and psychometric instruments, and group and individual tasks.

(d) Attempts have been made to go beyond the global description of the program model as an independent variable to the point of identifying and measuring specific independent variables within the program model (i.e. process variables): teacher behavior, child behavior, instructional setting, and classroom environment.

(e) Relationships between specific process variables and child outcomes have been examined in order to identify the critical treatment variables.

These characteristics are important considerations for future research. The recent comparative studies have incorporated a greater variety of dependent variables than earlier ones. In addition to examining impact on reading and mathematics learning, however, other curriculum areas should be systematically included: music, art, drama, movement, science, and language arts. This is especially important given the Stallings' data. These data corroborate a prediction of the Harnischfeger-Wiley model (Hallinan, Note 1): The amount of

time spent in instructional activities in a particular curricular area relates directly to an individual's mastery of skills in that area. Cognitive-discovery and, especially, discovery programs include a wider variety of curriculum areas. Outcomes in these areas should be assessed.

Measures of specific functions rather than global functions may prove more enlightening in future comparative research. Global preschool achievement measures resulted in few differences, whereas specific measures yielded several differences (Soar and Soar, 1972; Smith, 1973; Weisberg, 1974; Stallings, 1975; and Karnes, 1973).

The way a variable is assessed may also be critical. Minuchin et al. described how discovery classrooms children's lack of familiarity with test taking procedures may have accounted for their attempting fewer items. Differences in scores on achievement tests may be due to differences in children's ability to employ task-appropriate attentional and social behaviors rather than due to skill difference. Achievement tests probably should not be the only measure of skill acquisition in a given area. These tests represent a limited sample of behavior and thus have limited "ecological validity." Performance on the test may bear little relationship to real life application of that skill.

Strategies which assess the adroitness, ease, and degree to which the child uses written material to acquire information in daily independent problem solving may have greater ecological validity than the achievement test scores. What is the breadth and depth of the subject matter that the child independently reads? When does he read? Is it solely in response to adult suggestion? Or is reading one book followed by selection of study of another and does the child have a rationale for this? How much information is garnered from books lying about the classroom that the child reads independently? Does he put his infor-

mation to use? Dependent variables of interest, in this case reading skills, must be assessed in ways other than traditional ones.

A critical dimension differentiating children in academic programs from those in other programs may be whether the task is structured by the child or by the adult. Tests are typically adult-structured. Tasks, which provide the child greater leeway in time and more opportunity to formulate and work on problems in his own way, provide an index of a skill different from that provided by the standardized achievement test. For example, David Weikart has developed the Productive Language Assessment Tasks (PLAT). These assess oral and written representations children construct of their concrete experiences (Note 2). Children are first asked to make something from a set of unstructured materials and are then asked to write about how they made it. Next they are asked to use another set of unstructured materials to generate and write a story. Each writing period is preceeded by a work period. The written samples are coded for descriptive variables such as fluency, syntax, organization, and an index of the clarity of communication is assigned.

Finally, future research must be characterized by the continued careful measurement of classroom process variables. These variables must then be related to child outcomes. Program comparisons that vary smaller numbers of independent variables may be more appropriate than comparisons of widely discrepant approaches. For example, in the Stallings study (1975) and the Miller and Dyer study (1975), negative-corrective feedback by the teacher appeared to differentially relate to specific skill acquisition versus problem-solving behavior and its components. Stallings found that adult corrective feedback ("that's wrong," "that's not right") was positively correlated with achievement test scores. The use of tokens was negatively related to problem-solving ability.

No direct relationship was reported between adult corrective feedback and problem solving. However, when children give their own corrective feedback it was found to be positively related to problem solving.

Miller and Dyer reported that the use of corrective feedback may have been responsible for lower inventiveness scores. Flexible thinking and divergent production have been identified as components of problem-solving ability. The findings of the Miller and Dyer and the Stallings studies provoke questions concerning the relationship between amount of corrective feedback and the development of specific skills and problem-solving abilities. High amounts of corrective feedback may facilitate specific skill learning, but significantly inhibit the development of problem-solving skills. Seeking evidence concerning this relationship provides an example of the type of comparative research that needs to be done.

Academically-oriented programs do enhance children's academic skills in targeted areas, especially reading and mathematics. Data from Stallings (1975), Soar and Soar (1972), and Minuchin et al. (1969) support this conclusion. A controversial and recent study of British children in traditional and informal schools has also supported this relationship (Bennett and Entwestle, 1976).

No consistent differences have been produced in psychometric intelligence or in self-concept. Programs may differentially affect problem-solving ability, depending upon how the variable is defined. Curiosity, inventiveness, and probably other motivational variables are differentially affected. The relationship between participation in an academically-oriented program and performance on specific achievement tests appears to be a consistent, firm one. However, what is needed are additional investigations of the relationship between program process variables and measures of child outcome.

Reference Notes

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